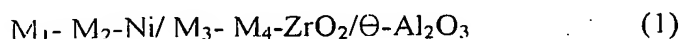


# BEST AVAILABLE COPY

## CLAIMS

### What is claimed is:

1. A modified  $\Theta$ - $\text{Al}_2\text{O}_3$ -supported nickel reforming catalyst expressed by the following formula 1, which is used for producing synthesis gas mixture of carbon monoxide and hydrogen from natural gas,



wherein  $\text{M}_1$  is an alkali metal; each of  $\text{M}_2$  and  $\text{M}_3$  is an alkaline earth metal; and  $\text{M}_4$  is a III B element or a lanthanide.

2. A nickel reforming catalyst according to Claim 1, which is composed of 3-20 wt.% of: nickel (Ni) against  $\Theta$ - $\text{Al}_2\text{O}_3$ ; 0-0.2 molar equivalent of  $\text{M}_1$  and 0-4 molar equivalent of  $\text{M}_2$  cocatalysts against nickel; 0-1.0 molar equivalent of  $\text{M}_3$  and 0.01-1.0 molar equivalent of  $\text{M}_4$  against zirconium; and 0.01-1.0 molar equivalent of  $\text{ZrO}_2$  against  $\Theta$ - $\text{Al}_2\text{O}_3$ .

3. A nickel reforming catalyst according to Claim 1, wherein said  $\Theta$ - $\text{Al}_2\text{O}_3$  support is modified with modified zirconia ( $\text{M}_3\text{-M}_4\text{-ZrO}_2$ ) m1423 ) thrrrecipitation or sol-gel method.

4. A nickel reforming catalyst according to Claim 1, wherein said nickel and cocatalyst ( $\text{M}_1\text{-M}_2\text{-Ni}$ ) is supported on the modified support ( $\text{M}_3\text{-M}_4\text{-ZrO}_2/\Theta\text{-Al}_2\text{O}_3$ ) through molten-salt or impregnation.

**BEST AVAILABLE COPY**

5. A method for producing synthesis gas mixture of carbon monoxide and hydrogen from methane natural gas by steam reforming, oxygen reforming or steam-oxygen reforming, wherein a catalyst selected from Claims 1 to 4 is used; methane-to-steam molar ratio is 0-6; methane-to-oxygen molar ratio is 0-1; reaction temperature is 600-1000°C; reaction pressure is 0.5-20 atm; and space velocity is 1,000-1,000,000cc/hr·g-cat.

6. A producing method of synthesis gas from natural gas according to Claim 5, wherein: for steam reforming, methane-to-steam molar ratio is 1-6; for oxygen reforming, methane-to-oxygen molar ratio is 0.1-1; and for steam-oxygen reforming, methane-to-steam molar ratio is 1-5 and methane-to-oxygen molar ratio is 0.1-1.